EXECUTIVE SUMMARY

CAUSAL MECHANISM REPORTS AND PRESCRIPTIONS

MAP ATTACHMENTS

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The South Fork Skokomish Watershed Analysis was convened by Simpson Timber Company and the Washington Department of Natural Resources - South Puget Sound Region. Funding was by Simpson Timber Company with cooperation from the Skokomish Tribe, The Washington State Department of Natural Resources Forest Practices Division, The Washington State Department of Fish and Wildlife, and The Washington State Department of Ecology.

The methods used in this Level 2 analysis followed those outlined in Version 3.0 of the Watershed Analysis Manual as prepared by Washington Department of Natural Resources and approved by the Washington Forest Practices Board in November 1995. The riparian function analysis was prepared according to Version 3.1 of that module.

The following information is taken largely from the individual module assessment reports.

1.0 WATERSHED OVERVIEW

1.1 Location, Ownership and Land Use

The Skokomish River is located in the southeastern corner of the Olympic Peninsula. The South Fork Skokomish Watershed Administrative Unit (WAU) extends from the headwaters of the South Fork Skokomish to the Eells Spring Hatchery, downstream of the confluence with the North Fork Skokomish.

The WAU comprises approximately 67,000 acres. About 80% of the basin is managed by the US Forest Service. Simpson Timber Company owns approximately 13% of the WAU. Other landowners include the National Park Service and numerous individuals. Logging is the primary land use in the basin. Several farms and a number of private residences are located in the Skokomish Valley.

1.2 Geology

The bedrock in this basin is predominantly submarine basalt flows and tuffs which have been lifted and tilted to a generally southeast dipping orientation. In the uppermost headwaters, bedrock consists of bedded marine slates, argellites, and sandstones. Continental glaciation extending from the mountains in British Columbia overran the lower basin and deposited hundreds of feet of sediment in the southeast corner of the basin and deposited a thin veneer of unstable sediments on some hillslopes. Soil depths are variable. Where glacial sediments are deposited in valley bottoms, soils are deep. On steep hillslopes, however, soils are typically less than 3 ft in depth, and often less. There are, however, local lenses of thicker soils of glacial origin on hillslopes. Subsequent river downcutting has formed the steep gorges and valley walls, and broad flat alluvial valley bottoms in the lower basin, and has formed smaller gorges in the upper basin. Alpine glaciation in the upper basin has steepened side slopes and rounded valley bottoms leaving substantial deposition in the valley bottoms, particularly in the upper South Fork upstream of Holman Flats near the confluence of Brown Creek, and thinner deposits scattered across the steep valley walls. Further discussion of the glacial history of the basin is included in Appendices C (Hydrology) and E (Stream Channels).

1.3 Climate and Streamflow

The following description of the climate in the South Fork Skokomish basin is paraphrased from the USFS watershed analysis (page 3.3.5, Stoddard and Park, 1995):

> The current climate in the South Fork Watershed is characterized by cool, wet winters and dry summers. The typical climatic cycle is recognized by a dry season July through August, followed by a rainy season that reaches its peak in November, December, and January. Average annual precipitation varies from over 200 inches at higher elevations to 90 inches in the southern portion of the South Fork. Almost 90% of the average annual precipitation falls between mid-September and May 1. Frequent long-duration (12-72 hour) storms of low to moderate intensity (0.2-0.5 inches per hour) occur from mid-September to April. Maximum 24-hour precipitation totaling 7 inches has the probability of occurring nearly every year; a 9 inch event in 24 hours has the probability of occurring every 5 years, according to the National Weather Services's Frequency Atlas of the Western United States - Volume IX - Washington (Harr, 1981).
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> Snow is uncommon in most years below the 1000 foot elevation. In general, snow accumulates above the 2500 foot elevation, and a snow pack persists above this elevation through late spring (Harr, 1981). Molenaar et al. (1973) contend that snow melt provides most of the water to the streams in the dry summer months, but groundwater actually provides most of the base flow at this time since there is rarely any snowpack remaining in the watershed in August. Snow and rain are common between 1000 and 2500 feet. Generally shallow snowpacks (less than 15 inches deep) accumulate and melt quickly several times each winter as alternating cold fronts and warm fronts transit the area (Harr, 1981).

The highest elevations in the watershed are about 5400 feet in the Olympic Mountains, and the low point is 50 feet in elevation in the Skokomish Valley at the confluence with the North Fork Skokomish. Forty-nine percent of the watershed is in the transient snow zone, or rain-on-snow zone, between about 1400 and 3600 feet. The rain-on-snow zone is the portion of the landscape in which timber harvest is most likely to affect hydrologic processes and peak flow generation.

1.4 Public Resources

1.4.1 Fish species and Distribution

Ten native and one introduced species of salmonids utilize the South Fork Skokomish watershed administrative unit. In total we recognize 14 races of native salmonids, three of which (spring chinook, pink, and early chum salmon) have been virtually extirpated from the WAU today. Fish production in the South Fork Skokomish WAU can be organized into four principle areas; 1) alluvial mainstems, 2) bedrock gorges, 3) large incised tributaries, and 4) small alluvial terrace tributaries. What is typically the most productive anadromous fish habitat base, medium to large sized low gradient tributaries, are either absent (steep slopes) or inaccessible (natural barriers) in this WAU. Current habitat condition is highly variable in the WAU and is strongly influenced by channel type and local sediment dynamics, much of which is natural but in some important cases has been significantly affected by management. LWD abundance in the WAU is good overall. Most of the major tributaries have generous old growth buffers throughout their fish bearing reaches and there has been significant delivery of LWD into fish bearing areas from small steep tributaries by mass wasting processes. Prognosis for fish stocks in the WAU varies by species. Resident trout appear to be secure as do the spring spawning steelhead, whereas the large bodied fall spawning species (coho, chum, fall chinook), are more at risk due to limited habitat availability and its dynamic nature.

1.4.2 Water Supply/Public Works

Public works include the state-operated Eells Springs Hatchery, the County-maintained Skokomish Valley and Eells Hill Roads, three bridges on the Skokomish Valley Road, and PUD power lines extending along the Skokomish Valley Road and up to Camp Govey. Water supplies for the hatchery have been interrupted by mass wasting on Eells Hill, and segments of the Skokomish Valley Road are periodically flooded.

1.5 Vegetation

The following information on dominant tree species in the South Fork Skokomish Watershed is taken from the US Forest Service Watershed Analysis. The mature lowland forest is dominated by Douglas-fir and western hemlock with some western red cedar. Between approximately 2500 and 4000 feet, the silver fir and western hemlock are the dominant species, with less Douglas-fir. From 4000 to 5000 feet, mountain hemlock and silver fir dominate, and above 5000 feet is the non-forested Alpine zone.

1.6 Land Use

Almost all of the South Fork basin is used for commercial timber production and is managed by the Forest Service and Simpson Timber Company. The Skokomish Valley is used for agriculture and residential purposes, and is home to much of the Skokomish Reservation.

Since the late 1920's, approximately 60% of the South Fork watershed has been logged. Currently, about 40% of the watershed is either virgin timber (most of which is over 290 years old) or alpine vegetation. Very little logging has taken place in the last 10 years, and stands less than 15 years old currently comprise only 10-15% of the watershed.

2.0 RESOURCE CONDITIONS REPORT

The individual assessment reports analyze
- public resources in the watershed;
- the stream channel network and how it has changed over time;
- the physical processes governing the contributions of sediment and water and the effects of forest practices on those processes; and
- the function of riparian vegetation in the watershed.

Through the "synthesis" processes the analysts link the contributions of wood, water, and sediment to public resources and assess the contributions of forest practices to changes in these processes. Where there is an actual or potential adverse effect of forest practices on public resources, the team prepares a causal mechanism report, stating issues to be addressed by the prescription team (see the Causal Mechanism Reports).

The assessment team findings for the South Fork Skokomish Watershed Analysis are summarized below.

2.1 The Channel Network

The South Fork Skokomish Watershed drains approximately 105 square miles in the southeastern corner of the Olympic Peninsula. There are at least 517 miles of stream channel in the watershed. Its largest tributary is Vance Creek, which drains approximately 23.5 square miles. The South Fork and Vance Creek join in the Skokomish Valley about two river miles above the confluence with the North Fork Skokomish. The confluence with the North Fork is the lower end of the watershed being analyzed. Downstream of the WAU, The South Fork and North Fork join to form the Skokomish River, which flows about 11 miles in a wide depositional floodplain before discharging into Hood Canal at the Great Bend.

Owing to the high stream power and high runoff in this watershed, and the position of alluvial mainstem channels at the mouth of virtually all major sub-drainages, sediment produced by mass wasting is likely to be routed to channels with vulnerable fish habitat in the WAU within the time frame of management activities (approximately 50 years).

With respect to likely influence of management-related mass wasting on downstream channel aggradation (outside of the WAU), analysis of sediment storage, sediment transport, and long-term sediment routing strongly suggests that the bulk of coarse sediment produced since forest management began in the WAU is unlikely to have been transported beyond the confluence of the North Fork Skokomish River. Residence time for coarse sediment in the upper South Fork valley upstream of Holman Flat is on the order of centuries, with estimated minimum values ranging from about 90 to over 160 years. For the lower South Fork above Vance Cr., the range of most probable residence times is about 40 to 70 years.

With respect to Vance Creek, on the other hand, it is likely that management-induced mass wasting has contributed significantly to apparent aggradation in the upper alluvial valley of Vance Creek, located between the Simpson 800 Road Bridge and the upper County Road bridge over Vance Creek. In this reach of Vance Creek, the volume of sediment in storage has increased over the period 1929 to 1995 by an amount comparable to the amount of delivered coarse sediment (estimated by the landslide inventory) to upper Vance Creek. The estimated residence time for coarse sediment in the gorge of Vance Creek is about 5 years, strongly suggesting that the sediment produced in upper Vance Creek may have been routed through the gorge to the upper alluvial valley which begins at the Simpson 800 Road bridge. For the upper alluvial section of Vance Creek, between the Simpson 800 bridge and the uppermost County Road bridge, the range of most probable residence times is about 40 to 70 years. For lower Vance Creek downstream of the uppermost County Road bridge residence time estimates ranging from about 10 to 20 years.

2.2 Sediment

2.2.1 Mass Wasting

Examination of aerial photography of the basin revealed almost 600 mass wasting events that have occurred during the past fifty years, 65% of which were associated with the road network and presumably would not have occurred in the absence of forest management. Of these 600 events, about 57% delivered substantial sediment to the channel network. It is estimated that mass wasting in this basin delivered about 230,000 cubic meters (about 300,000 yd^3) of sediment to the stream network since 1946, excluding a significant quantity from persistent, natural near-channel sources that could not be quantified from aerial photographs. It is difficult to determine whether this is a significant increase over the pre-management delivery rate, both because the types of failure common to this basin are difficult to identify through a closed forest canopy, and because high rates of background sediment delivery from natural, near-channel sources mask the effects of management practices. The density of landslides under largely-pristine conditions was about 1.1/km^2. For those portions of the watershed that were harvested, the density of landslides was about 3.4/km^2, an increase of about 210%. In the portion of the watershed where management-related landslides were most common, the increase in landslides was about 380%. Regardless of the proportion of increase in mass wasting attributable to management, the total volume of sediment delivered from 1946 through 1995 to the channel network estimated through the landslide inventory is only 6% of the total estimated sediment storage in the channel network. This is equivalent to annual mass wasting inputs of about 0.1 % of total sediment storage in the channel network.

2.2.2 Surface Erosion from Hillslopes

Initial examination of the various soil maps for the basin uncovered no unusually erodible soils such as sand, ash, or serpentine soils. Eleven of the thirteen harvest units on Simpson ownership and two current harvest units on USFS land were field-checked. The harvest units included slopes from flat to over 90% slope, and both ground-based(shovel and skidder) and cable yarding systems. Of the sites visited, none had significant amounts of exposed soil, whether on steep or gentle slopes, whether harvested with ground-based or cable yarding systems.

2.2.3 Surface Erosion from Roads

After comparing road erosion rates to the calculated background erosion rate, all sub-basins but three are rated LOW hazard. This rating seems appropriate when considering the following contributing factors:

1) The road abandonment program carried out in recent years by the US Forest Service and Simpson Timber Company has eliminated many problem roads, especially mid-slope roads.

2) Maintenance and upgrading of remaining roads has improved the condition and reduced erosion from these roads.

3) The number of road miles actually in use for haul now and in the near (5 years) future is low.

The Fir Creek sub-basin and the Lower and Middle Vance Creek sub-basins are rated Moderate for surface erosion from roads, as compared to the calculated background rate. The Windy Creek road provides about 90% of the road sediment in the Lower Vance Creek sub-basin, while the area where Camp Govey and Cushman roads meet and cross a tributary to Fir Creek and mainstem Fir Creek provides about 80% of the road sediment in the Fir Creek sub-basin.

2.3 Peak Flows

The topography, form, and climate of the South Fork Skokomish watershed ensure that overbank flows are common in the South Fork Valley. Analysis of flow records and historical documents show that serious flooding has always occurred in the Skokomish Valley. Flooding has occurred before and after the initiation of large scale logging and the construction of the Cushman Dam. Because of the temporally random nature of flood flows, large flows may occur in relatively quick succession and then cause people to wonder if something happened to increase flooding. The two largest flows on record have occurred in the past 6 years, one in 1990 and one in 1994. The occurrence of such large flows in rapid succession has contributed to a perception that flooding is getting worse, but there is nothing to indicate that timber management activities contributed significantly to the magnitude of these events.

Under today's vegetative conditions, the TFW peak flow model does not predict significant flow increases relative to fully mature vegetative cover in any of the sub-basins in this watershed. The model predicts that significant changes are possible in almost all of the sub-basins under hypothetical fully-clearcut conditions (i.e., no timber standing).

While timber management has had little impact on flows at the watershed scale, it could have ramifications for channel structure and fish habitat conditions at a sub-basin scale. Based on analysis of potential rain-on-snow effects of clear-cutting and on channel sensitivities to peak flow increases, it is recommended that future management plans maintain some mature timber and limit the clearcut area at any given time within the following sub-basins: Church Creek, Pine Creek, Cedar Creek, Lebar Creek, Brown Creek, and Vance Creek.

The hydrologic impacts of clear-cutting are usually short-lived. Typically, a regenerated timber stand recovers most of its hydrologic function within 7-8 years, and recovers almost all hydrologic function within 15 years. Timber stands in some places in this watershed, however, are taking significantly longer to mature. Timber regeneration in the higher elevations of the watershed is highly variable. In some units it takes more than 10 years for timber to reach 10% crown closure and 20 years to reach 90% crown closure. It appears that south-facing, high elevation slopes where slash was burned have the most serious regeneration problem. Future timber management in the higher elevation, south-facing slopes should take care to maintain soil productivity in these areas. These areas are likely to have thin soils owing to steep slopes and geologic history that includes scour by glacial ice as little as 15,000 years ago.

2.4 Wood

Overall the South Fork Skokomish basin is in moderately good condition in terms of current and future in-channel large woody debris (LWD). Due to high channel sensitivity ratings and the existence of some areas where human impact has depleted in-channel LWD, some areas of the basin are in a High LWD Recruitment hazard category. This factor is balanced by the existence of a good amount of riparian stands with High Near Term recruitment ratings throughout most of the basin. The existence of these stands as well as the emergence of some conifer trees in the lower rated areas makes the prospects for future improvement of the basin also very good. With the maturation of the young plantations and the natural degeneration of hardwood riparian stands, the proportion of the riparian areas with high near term LWD recruitment potential will increase.

2.5 Shade

The main stem of the South Fork Skokomish River system is not meeting shade levels specified by the Watershed Analysis Manual over large portions of its length. The mainstem is relatively wide and braided, so this lack of shade is a natural condition. Additionally, the Resource Assessment team has observed that stream temperatures in this WAU are relatively cool, probably as a result of the prevalence of spring-fed water sources for the streams, and fish populations are not being adversely impacted. The team also concluded that managing the riparian stands for LWD would result in practices that promote adequate shade levels.